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(54) A collapsible tube with a membrane cap

(57) A collapsible dispensing tube consists of a cylindrical body (1) of laminated sheet, a synthetic resin, two part head (2) and a membrane cap (5). The laminated body (1) is formed of an inner metallic sheet (1a) and outer synthetic resin layers (1b, 1c). The head (2) has a mouth and a shoulder (3) and consists of two members (2a, 2b) which are bonded together each member being formed of a different synthetic resin material such that one member is water-proof and the other is air-tight. The membrane cap (5) is formed of a laminated sheet comprising an upper layer (5b), preferably of the same material as the outer head member (2a), an aluminium sheet (5a) and a film of adhesive resin paint (5c). The cap (5) is received between a receiving surface ($2a_1$) of the outer head member and the upper surface of the inside layer member ($2b_1$), the upper layer (5b) being welded to the receiving surface ($2a_1$). The body is welded to the shoulder of the head. The head members may be provided with co-operating annular protrusions and recesses in the shoulder region, the outer head member being preferably of polyethylene or polypropyrene and the inner head member being of polyethylene terephthalate, polybutylene terephthalate, melamine resins, urea resins or phenolic resins.

Fig. 1

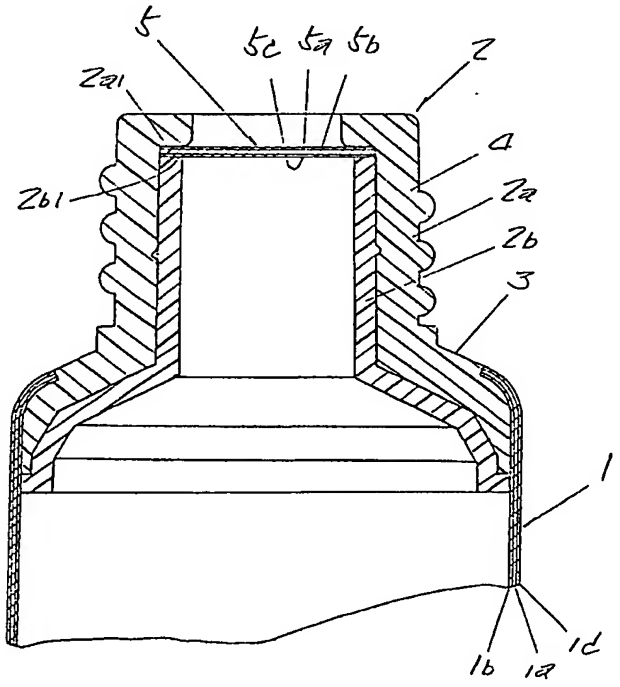

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Fig. 1

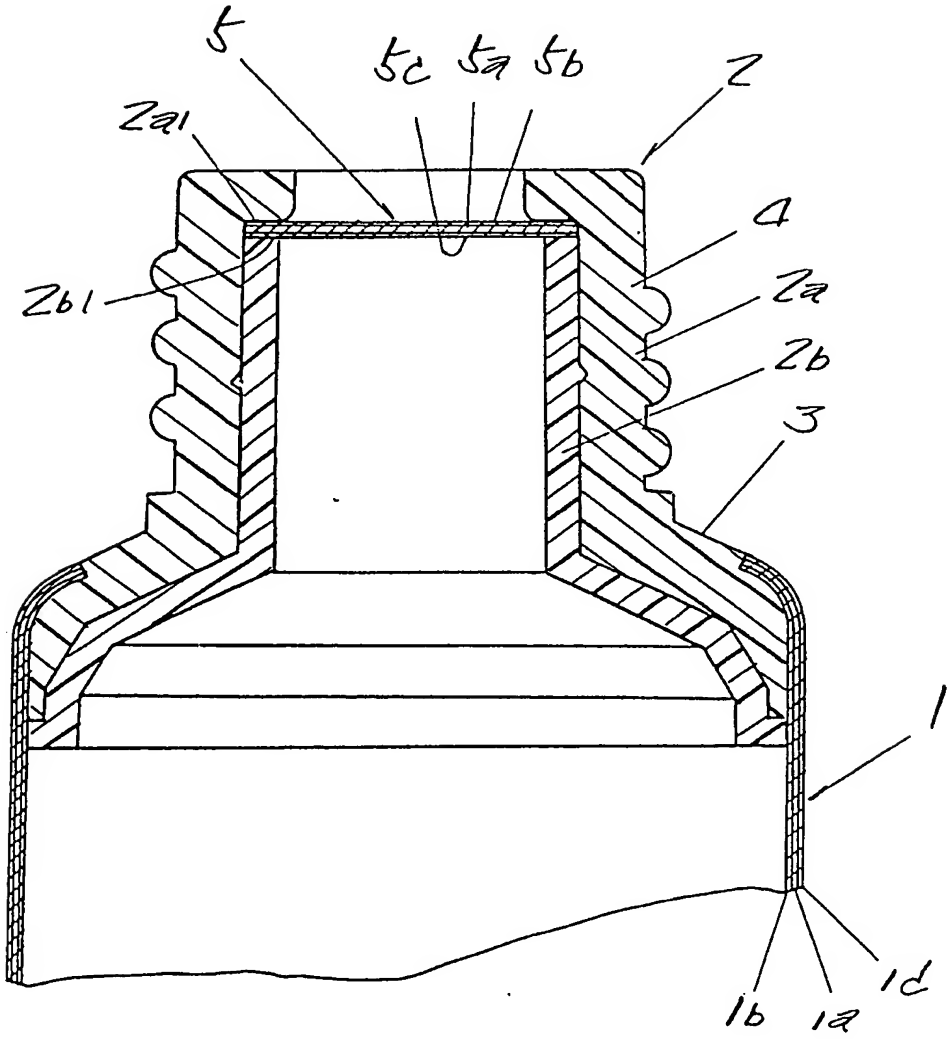

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Fig. 2

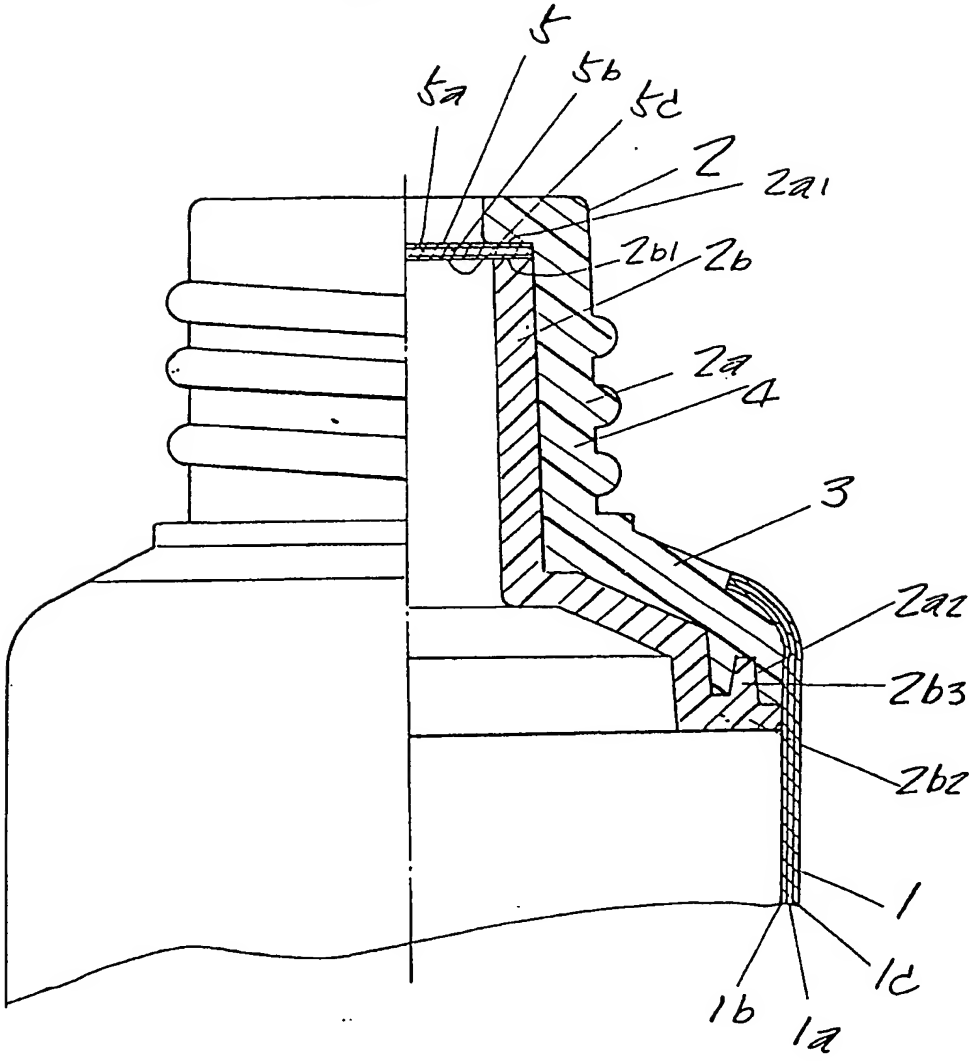


Fig. 3

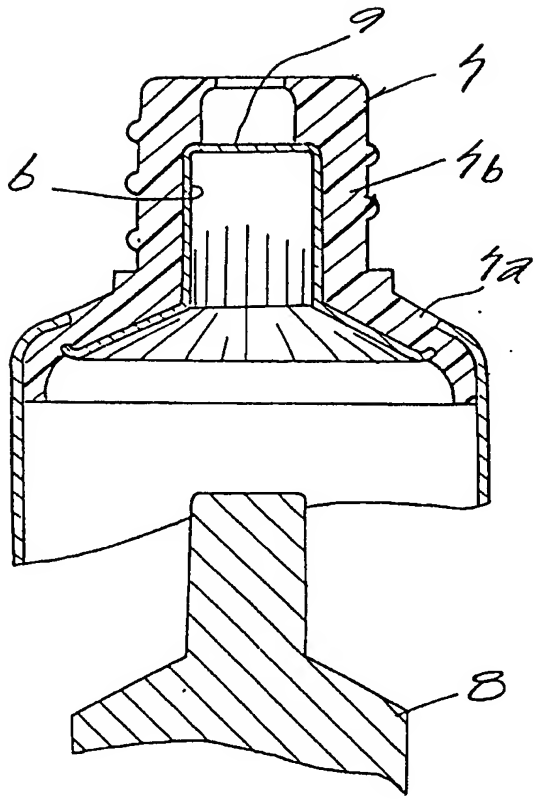
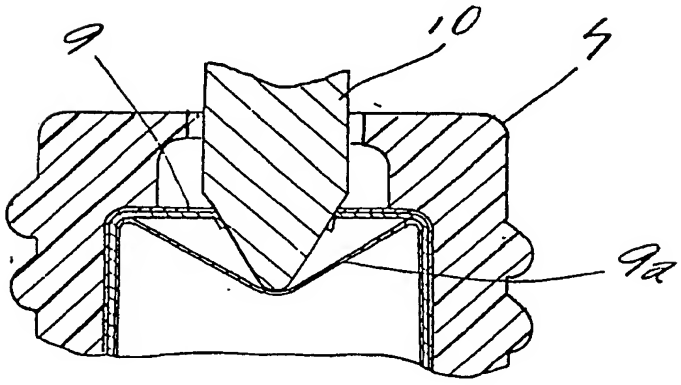


Fig. 4



SPECIFICATION

A collapsible tube with a membrane cap

The present invention relates to a collapsible dispensing tube for housing cream-like substances, such as foodstuffs and toothpaste, in particular to an improvement of a collapsible tube with a membrane cap consisting of a cylindrical body formed of a laminated sheet and a head made of synthetic resin, said laminated sheet being formed of an inner metallic sheet and outer synthetic resin layers laminated on both sides of the metallic sheet, said head being provided with a mouth member and a shoulder member integrally formed with the mouth member.

In general, a method of producing such tubes has been widely used in which a body is made by cylindrically winding a laminated aluminium sheet provided with a synthetic resin film on both sides, said body being provided at the upper end with a synthetic resin head, in which a mouth member and a shoulder member are integrally molded. However, with such a tube, since the head is formed of a single synthetic resin material, it is impossible to simultaneously satisfy air-tightness and water-proofness to a high degree. This is due to the fact that a synthetic resin material lacks water-proofness if it is highly air-tight while it lacks air-tightness if it is highly water-proof.

Accordingly, in order to satisfy both air-tightness, i.e, the gas barrier property and water-proofness, a device as shown in Figure 3 was proposed. That is to say, a laminated aluminium sheet 6 provided with a polyolefin type synthetic resin film laminated on both sides is molded from a push die 8 in a drawing manner along the internal surface of a head 7. The head 7 comprises a shoulder member 7a and a mouth member 7b, such that the head is entirely covered over the internal surface and at the same time a blank cap 9 is formed.

However, with such a device there existed the possibility that the synthetic resin film layer would be damaged due to abnormal extension and bending in the drawing process of the laminated aluminium sheet 6 to the internal surface of the head. The metallic layer is then subjected to corrosion and becomes less air-tight and the pin hole phenomenon (a phenomenon where holes, appearing as pin points, are generated) occurs since the blank cap portion is also extended by the drawing process.

However, with such a device, there is the following important problem: Since the laminated aluminium sheet is extended by the drawing process, it is necessary to form the synthetic resin film which is to be laminated on said aluminium sheet of extensible polyolefin type synthetic resin materials. Thus, polyethylene and the like have been usually used. However, polyethylene does not adhere well to aluminium and it is partially stripped during extension even though adhesives are used depending on each set of circumstances. In addition, there exists the possibility that the comparatively highly penetrative contents within the tube penetrate the resin film layer to chemically act upon the boundary surface between the resin film layer and the aluminium surface, thus noticeably reducing the adhesive strength or stripping the resin film layer. When this stripping phenomenon occurs on the lower surface of said blank cap 9 or the resin film layer is likely to strip away, since the lower film layer 9a is pushed down by a projection member 10, as shown in Figure 4, the blank cap 9 can not be penetrated by the projection member 10.

Thus, it is a main object of the present invention to provide a dispensing tube with a blank cap which can solve the problems of the conventional device.

Accordingly, there is provided a collapsible tube with a membrane cap consisting of a cylindrical body formed of a laminated sheet and a head made of synthetic resin, said laminated sheet being formed of an inner metallic sheet and outer synthetic resin layers laminated on the both sides of the metallic sheet, said head being provided with a mouth member and a shoulder member integrally formed with the mouth member, wherein said head is formed of a bonded body consisting of two members - an outside layer and an inside layer, one of said outside layer and inside layer being formed of synthetic resin materials one of which is water-proof and the other of which is air-tight, said head being provided with a membrane cap for sealing said mouth member at the upper end portion of the mouth member, said membrane cap being formed of a thin composite laminated sheet in which a synthetic resin film which can be welded to the outside layer of the head is laminated on the upper surface of an aluminium sheet as a substrate while a film of adhesive resin paint or other such materials is laminated on the lower surface of the aluminium sheet, said blank cap being situated between a receiving surface on said outside layer and the upper end surface of the inside layer round the upper circumference and the upper surface film of the blank cap being welded to the outside layer of the head.

The preferred embodiments of the present invention will be below described in detail with reference to the accompanying drawings, in which:

Figure 1 is a sectional view showing one preferred embodiment of the present invention,

Figure 2 is a sectional view showing another preferred embodiment of the present invention,

Figure 3 is a sectional view showing the conventional example, and

Figure 4 is a sectional view showing the state where a blank cap of the conventional example is opened.

Referring now to Figure 1, reference numeral 1 designates the body of the tube formed by cylindrically winding a laminated aluminium sheet 1a provided with synthetic resin films 1b, 1c made of polyethylene, polypropyrene or the like laminated on both sides, followed by welding overlapping edges to each other. In addition, a plurality of said synthetic resin film layers may be applied. Also, the internal surface film 1b of said body is formed of the same quality synthetic resin material as the outside layer member 2a of the head, which will be described later, to allow easy welding to said outside layer

member 2a.

Reference numeral 2 designates a head made of synthetic resin provided with a downwardly sloping shoulder member 3 and a narrowed mouth member 4, the slightly narrowed upper end portion of said body 1 overlapping said shoulder member 3 of the head to weld the adjacent resins to each other.

The head 2 is a bonded body comprising two members - an outside layer member 2a and an internal layer member 2b both the outside layer member 2a and the internal layer member 2b being separately molded and in close engagement with each other.

The outside layer member 2a is formed of synthetic resin materials, such as polyethylene and polypropyrene, and is waterproof while the internal layer member 2b is formed of synthetic resin materials, such as thermoplastic synthetic resins such as polyethylene terephthalate and polybutylene terephthalate or thermosetting synthetic resins such as melamine resins, urea resins and phenolic resins, and is air-tight.

In addition, said head is provided with a membrane cap or blank cap 5 for closing said mouth member situated at the upper end portion of the mouth member. Said blank cap 5 is formed of a thin aluminium sheet 5a as a substrate member provided with a synthetic resin film 5b made of synthetic resin materials which can be welded to said outside layer member 2a of the head, for example low-density polyethylene or polypropylene having the same quality as said outside layer member 2a laminated on the upper surface thereof and a film made of adhesive resin materials such as polyurethane synthetic resins and epoxy-contained synthetic resins laminated on the lower surface thereof.

Regarding the thickness of said blank cap 5, the aluminium sheet 5a, which is a substrate member of said blank cap 5, is 20 to 100 μ thick, most preferably 40 μ thick, the upper surface film 5b being 10 to 50 μ thick, most preferably 20 μ thick, and the lower surface film 5c being 3 to 15 μ thick, most preferably 7 μ thick.

In addition, said blank cap 5 is put between a receiving surface $2a_1$ formed on the internal surface of said outside layer member 2a and the upper end surface $2b_1$ of the internal layer member 2b round the circumference, the upper surface film 5b of the blank cap being welded to said outside layer member 2b. In this case, since said outside layer member 2a is made of polyethylene or polypropylene and the upper surface film 5b of said blank cap is made of low-density polyethylene or polypropylene which has the same quality as the polyethylene or polypropylene forming said outside layer member 2a, both said outside layer member 2a and said upper surface film 5b of said blank cap can be completely welded to each other, thereby achieving complete sealing of the welded portion. In addition, in the assembly of said head 2 the blank cap 5 can be easily inserted between the receiving surface $2a_1$ and the upper end surface $2b_1$ of the internal layer member by placing the blank cap 5 on the receiving surface $2a_1$ of the outside layer member 2a and putting the internal layer member 2a inside the outside layer member 2a. The welding of the upper surface film 5a of the blank cap to the outside layer member 2a may be carried out by heating with a heater when said internal layer member is inserted in the outside layer member or by high-frequency heating after completing the process of putting the internal layer member inside the outside layer member.

Furthermore, in the preferred embodiment as shown in Figure 1, since contact area between the outside layer member 2a of the head 2 and the film 1a of the body 1 is large and both the outside layer member 2a of the head 2 and the film 1a of the body 1 are formed of the same material, the adhesion between them is remarkably high but since the contact area between the internal layer member 2b and said film 1a of the body is remarkably small and they are formed of different materials, the adhesion of this portion is low. Accordingly, in the case where the contents of the tube generate a gas at high pressure, the body is expanded by the high pressure gas generated in the tube and extends the outside layer member 2a outwardly. Thus, a ventilation gap is produced between the outside layer member 2a and the internal layer member 2b and the gas escapes upwardly through this gap to pass through the flesh portion of the outside layer member, thereby leaking out. As a result, air-tightness is lost. The preferred embodiment as shown in Figure 2 was thought of in view of such a problem. The internal layer member 2b of the head 2 is provided with a flange member $2b_2$ at the lower end thereof, said flange member $2b_2$ being provided with an annular-shaped protrusion $2b_3$ formed on the upper surface thereof, and said outside layer member 2a being provided with a recess $2a_2$ cooperating with said protrusion on the lower end surface thereof to closely engage said protrusion $2b_3$ with said recess $2a_2$. In the preferred embodiment as shown in Figure 2, since the outside layer member 2a is firmly connected to the internal layer member 2b by close engagement of said protrusion $2b_3$ with said recess $2a_2$, the gap between the outside layer member and the internal layer member does not increase even under expension due to the internal pressure as described above, thereby ensuring air-tightness and sealing against highly penetrative contents.

In the preferred embodiment as shown in Figure 2, said protrusion $2b_3$ may be formed on the upper surface of the flange member of the outside layer member and said recess $2a_2$ may be formed on the lower surface of the internal layer member or vice versa.

As described above in detail, since the head 2 of a dispensing tube formed of synthetic resins according to the present invention is formed of a bonded body comprising an outside layer member 2a which is waterproof and an internal layer member 2b which is air-tight, both waterproofness and air-tightness can be simultaneously satisfied. In addition, since the upper surface film 5b of the blank cap 5 is integrally welded to the outside layer member 2a, a gap between the outside layer member and the internal layer member opening to the outside can be securely sealed by this welded

portion. Moreover, since the lower surface film 5c is formed of urethane or epoxy-contained sythetic resins which adhere strongly to aluminium, the blank cap can be broken through by a projection member without stripping away the lower surface film 5c. In addition, since urethane- or epoxy-contained synthetic resins do not extend in the same way as polyethylene, the blank cap can be easily broken through.

Whatsmore, according to the present invention, since laminated aluminium sheet does not extend on the internal surface of the head since it compresses differently than conventional tubes, as described earlier, there is no possibility that the resin film layer is damaged due to abnormal extension and bending such that the metallic layer is subjected to corrosion. Thus, the contents can be securely protected. In addition, since the blank cap does not extend by compression, there is no possibility of the said pin hole phenomenon occurring.

CLAIMS

1. A collapsible tube with a membrane cap consisting of a cylindrical body formed of a laminated sheet and a head made of synthetic resin, said laminated sheet being formed of an inner metallic sheet and outer synthetic resin layers laminated on the both sides of the metallic sheet, said head being provided with a mouth member and a shoulder member integrally formed with the mouth member, wherein, said head is formed of a bonded body consisting of two members - an outside layer and an inside layer, one of said outside layer and inside layer being formed of synthetic resin materials one of which is water-proof and the other of which is air-tight, said head being provided with a membrane cap for sealing said mouth member at the upper end portion of the mouth member, said membrane cap being formed of a thin composite laminated sheet in which a synthetic resin film which can be welded to the outside layer of the head is laminated on the upper surface of an aluminium sheet as a substrate while a film of adhesive resin paint or other such materials is laminated on the lower surface of the aluminium sheet, said blank cap being situated between a receiving surface on said outside layer and the upper end surface of the inside layer round the upper circumference, and the upper surface film of the blank cap being welded to the outside layer of the head.

2. A collapsible tube with a membrane cap as set forth in claim 1, wherein said outside layer of the head is formed of synthetic resin materials which are waterproof, said inside layer being formed of materials which are air-tight, the inside surface film of said body being formed of a synthetic resin material having the same quality as said outside layer, and the inside surface film of the body being adjacent to the shoulder member of the outside layer of the head to allow welding at the contact surface, whereby said body is integrally connected with said head.

3. A collapsible tube with a membrane cap as set forth in claim 1 or claim 2, wherein the synthetic resin which is waterproof is selected from the group consisting of polyethylene and polypropylene, and the synthetic resin materials which are air-tight are selected from the group consisting of thermoplastic synthetic resin materials such as polyethylene terephthalate and polybutylene terephthalate and thermosetting synthetic resin materials such as melamine resin, urea resin and phenolic resin.

4. A collapsible tube with a membrane cap as set forth in claim 1 or claim 3, wherein the upper surface film of said blank cap is formed of low-density polyethylene or polypropylene, the lower surface film of said blank cap being formed of chemically resistant synthetic resins or paints such as urethane type synthetic resins or epoxy-contained synthetic resins.

5. A collapsible tube with a membrane cap as set forth in claim 4, wherein said aluminium sheet is 20 to 100 μ thick, said upper surface film being 10 to 50 μ thick, and said lower surface film 3 being 15 μ thick.

6. A collapsible tube with a membrane cap as set forth in any one of claims 1 to 5, wherein the laminated sheet forming the body of the tube is an aluminium sheet forming a substrate on both sides of which a film layer formed of synthetic resin materials such as polyethylene, polypropylene and polyester is applied.

7. A collapsible tube with a membrane cap as set forth in any one of claims 1 to 6, wherein said head is provided with a flange member at the lower end of the inside layer, said flange member being provided with an annular-shaped protrusion or recess in the upper surface thereof, said outside layer being provided with a recess or protrusion closely engaging with said protrusion or recess in the lower end surface.

8. A collapsible tube substantially as herein described and as illustrated in Figures 1 and 2.

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